

CLAIMS

1. A pulse detonation engine (1) comprising a combustion chamber (2), an
5 igniting device (3), and a fuel injection device (4), comprising a plurality of injection valves (5) arranged in an axial direction (20), characterised in that the fuel injection device (4) injects fuel into the combustion chamber (2) which contains residual products (7) after a combustion, inter alia, free radicals.
- 10 2. A pulse detonation engine (1) as claimed in claim 1, characterised in that the injection valves (5) open simultaneously to inject fuel into the combustion chamber (5).
3. A pulse detonation engine as claimed in claim 2,
15 characterised in that the injection valves (5) inject a fuel/air mixture into the combustion chamber (2).
4. A pulse detonation engine as claimed in any one of claims 1-3, characterised in that the pulse detonation engine comprises more than 5 injection valves (5).
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5. A pulse detonation engine as claimed in any one of claims 1-4, characterised in that the pulse detonation engine comprises more than 18 injection valves (5).
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6. A pulse detonation engine as claimed in claim 1, characterised in that the nozzles (5_x) are arranged for sequence-controlled injection of the fuel into the combustion chamber (2).
- 30 7. A pulse detonation engine as claimed in claim 6, characterised in that the injection valves (5_x) inject a fuel/air mixture into the combustion chamber (2).
8. A pulse detonation engine as claimed in claim 6 or 7, characterised in that an injection valve injects fuel into the combustion chamber (2) shortly
35 before the detonation reaches the injection valve (5_{x+1}) to minimise the time during

which the fuel and the free radicals are mixed before the detonation front (10) detonates the mixture (8).

- 5 9. A pulse detonation engine as claimed in any one of claims 6-8, c h a r -
a c t e r i s e d in that the pulse detonation engine comprises more than 5 injection valves (5).
- 10 10. A pulse detonation engine as claimed in any one of claims 6-8, c h a r -
a c t e r i s e d in that the pulse detonation engine comprises more than 18
10 injection valves (5).
- 15 11. A pulse detonation engine as claimed in any one of claims 6-10, c h a r -
a c t e r i s e d in that the speed of the sequence control is close to the CJ
speed of the mixture of fuel/air and the residual products.
- 20 12. A pulse detonation engine as claimed in any one of claims 1-11, c h a r -
a c t e r i s e d in that the fuel is in gaseous form, for instance hydrogen gas or
acetylene, liquid form, for instance jet propulsion fuel which is injected into the pulse
detonation engine as an aerosol, or solid form, for instance boron, which is injected
into the pulse detonation engine in the form of a powder.
- 25 13. A method of initiating detonations in a pulse detonation engine (1),
c h a r a c t e r i s e d in that a fuel (6) is injected into a combustion chamber
(2) having an axial extension (20);
- 30 - that the fuel is injected into the combustion chamber (2) through a plurality
of injection valves (5) arranged along the axial extension (20) of the
combustion chamber;
- that the fuel (6) is mixed with combustion gases (7) remaining in the combustion
chamber (2) and comprising free radicals, from the preceding
detonation; and
- that the thus obtained mixture is caused to detonate.
- 35 14. A method as claimed in claim 13, c h a r a c t e r i s e d in
- that all injection valves (5) inject fuel simultaneously into the combustion
chamber (14).

15. A method as claimed in claim 13, characterised in
- that the injection valves (5) are controlled individually for the injection of the fuel into the combustion chamber (2).
- 5 16. A method as claimed in claim 15, characterised in
- that the injection valves (5) are sequence controlled at a speed close to the detonation speed of the mixture of fuel/air and the remaining combustion gases.
- 10 17. A method as claimed in any one of claims 13-16, characterised in
- that the injection valves (5) inject a fuel/air mixture into the combustion chamber (2).